

REMARKS

Claims 47-72 are pending in this application. Claim 72 has been amended for the reasons noted herein.

Claim Objections

Claim 72 has rejected under 37 C.F.R. § 1.75(c) as being improperly dependent on claim 69. Applicant thanks the Office for noticing this error. And since claim 72 has been amended to correct this error, Applicant respectfully requests withdrawal of this objection.

Rejection under 35 U.S.C. §103

Claims 47-72 have been rejected under 35 U.S.C. § 103 as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of Shibata (U.S. Patent No. 6,461,890) and Kaneda et al. (U.S. Patent No. 6,223,429) for the reasons described in pages 2-4 and 5-20. Applicant respectfully traverses this rejection.

The Office argues that AAPA describes the invention substantially as claimed. While the Office recognizes that the AAPA does not teach certain of the claim limitations, it argues that such limitations would have been obvious in light of Shibata, Kaneda et al., and/or the common knowledge in the art.

1. Stud Bump

The Office argues that AAPA discloses a stud bump (35) located on a portion of the RDL pattern not covered by the insulating layer. Applicant respectfully disagrees with this interpretation of the AAPA. The AAPA describes that in Figure 1, number 35 is used to designate a solder bump and not a stud bump. And in light of Figures 2 and 3, which show that

a solder ball and a stud bump are different components, the skilled artisan would have understood that Figure 1 shows a solder bump 35—and not a stud bump—as located on a portion of the RDL pattern 20.

2. Leadframe With Bond Pad

The Office recognizes that AAPA fails to teach a leadframe substrate containing a bond pad. The Office contends that Shibata contains a leadframe containing a bond pad and an adhesive material containing conductive particles between the leadframe a chip. The Office argues that it would have been obvious to use the leadframe with the adhesive taught by Shiabta et al. in the AAPA because it is conventionally known to connect a chip to a leadframe using a conductive adhesive. The Office notes that the use of conventional materials to perform their known function is obvious.

Applicant assumes that the Office implies that it would have been obvious to use the conductive adhesive of Shibata (along with the attached leadframe) in the invention of AAPA. But why would the skilled artisan have used the conductive adhesive of Shibata as an attachment mechanism when the AAPA already contains such an attachment mechanism: the solder bump 35. Given that the AAPA already describes that their device contains a solder ball (which the skilled artisan knows could be used as an attachment mechanism to a lead frame), the skilled artisan would probably not be motivated to change from the solder ball to the conductive adhesive of Shibata et al. absent a reason for such a modification being provided.

Is the conductive adhesive of Shibata being used in combination with the solder bump 35? If so, why use an additional attachment mechanism? Or is the conductive adhesive of Shibata being used in place of the solder bump 35? If so, why would the skilled artisan replace

the solder bumps with the conductive adhesive? Simple stating that the conductive adhesive is a known material and therefore can be used completely ignores the existence of the solder bumps 35 explicitly described by AAPA.

3. Conductive Particles

The Office recognizes that the combination of AAPA and Shibata fails to teach that the conductive particles comprise metal with an insulating layer. The Office argues that such a feature would have been obvious in light of column 6, lines 35+ of Kaneda et al. which teaches that this type of conductive particle improves the insulating property in the lateral direction. In essence, the Office argues that the skilled artisan would have been motivated to modify the device of Shibata by replacing its conductive particles 32 with the conductive particles 2-6 of Kaneda et al. because the Kaneda et al. conductive particles 2-6 would have improved the insulating properties in the lateral direction of the device of Shibata.

Applicant respectfully disagrees. The Office has not substantiated that the skilled artisan would understand that such an insulating property is needed and so would not be motivated to make the combination proposed by the Office. Kaneda et al. disclose that the electrical conduction between a bonding pad 2-2 and a terminal 2-7 is ensured through the conductive particles 2-6 contained in the anisotropic conductive adhesive material. Kaneda et al. also disclose that with regard to the conduction to adjacent terminals, the insulating resin (of the adhesive material) present between the particles provides no electrical conductivity and ensures anisotropic conductivity only in the direction of contact bonding. *See column 4, line 62 through column 5, line 4.* In other words, the skilled artisan would have understood that the device of

Kaneda et al. purposely wanted anisotropic conductivity in the lateral direction and not in the horizontal direction.

It is true that Kaneda et al. describe—as noted by the Office—that the insulation in the lateral direction could be improved by thin organic insulating films on the metal particles. But would the skilled artisan have wanted to add to the insulation when Kaneda et al. also describe that it is not needed? Probably not, since such a modification would have only increased the cost and complexity of making the conductive particles 32 of Shibata because of the additional step of forming the thin organic insulating film on the particles 32.

4. Non-Polymeric Insulating Layer

The Office recognizes that the combination of AAPA, Shibata et al., and Kaneda et al. fail to teach that the insulating layer comprises a non-polymeric insulating layer. The Office notes that the AAPA is silent as to the material used as the insulating layer that covers the RDL, but that it would have been obvious to use a non-polymeric insulating material (such as silicon dioxide) since it is a common material used as an insulating layer. The Office notes that the use of conventional materials to perform their known function is obvious.

The problem with the Office's argument is that the AAPA is not silent as to the material used as the insulating layer that covers the RLD pattern. In paragraph [0013], the AAPA discloses that the two insulating layers (15 and 25 in Figure 1) are made of polymeric materials, such as polyimide and benzocyclobutene. In light of this disclosure, the skilled artisan would have used a polymeric material in the insulating layer that covers the RDL, and not a non-polymeric material as proposed by the Office.

5. Stud Bumps Comprising Cu

The Office also recognizes that Shibata fail to teach that the stud bump comprises Cu, as recited in some of the dependent claims. The Office argues, however, that it would have been obvious to replace the Au material in Shibata with a Cu material because these two materials are known to be equivalent materials used as bumps.

Applicant argued previously that to rely on equivalence as a rationale supporting an obviousness rejection, however, the equivalency must be recognized in the prior art. *See M.P.E.P. § 2144.06; In re Ruff*, 256 F.2d 590, 118 USPQ 340 (CCPA 1958). Shibata describes, though, that the metals forming the terminals and the conductive grains are so properly selected as to form a eutectic alloy on contact portions thereof. *See column 4, lines 1-4*. Thus, the metals are carefully selected by Shibata so that a specific result is obtained, i.e., so that a eutectic alloy is formed. But the Office has not shown that if the stud bump comprises Cu, as proposed, such a eutectic alloy would be formed.

In response to these arguments, the Office argued that it would have been obvious to replace the Au material disclosed column 7, lines 45+ of Shibata with a Cu material because Cu can form a eutectic alloy, such as Al/Cu and Sn/Ag/Cu alloys.

Applicant then responded that the Office provided no evidence to support such arguments. In the latest Office Action, the Office merely replied on page 4 that the rejection did not state anything relating to the ability of Cu to form eutectic alloys. And the Office is correct: the rejection did not state that. But this requirement is imposed by the prior art, which indicates that not just any metal can be used, but a metal that form a eutectic alloy. And a proposed combination that uses a metal not forming a eutectic alloy as required by the prior art would not be obvious because it would teach away from the prior art.

6. Pd Coated Cu Wire

The Office recognizes that the combination of AAPA, Shibata, and Kaneda et al. fail to teach that the stud bump is formed by wire bonding a Pd coated Cu wire to the RDL pattern using a capillary to provide the stud bump with a coined shape. The Office indicates that the wire bonding process limitation holds little patentable weight because the rejected claims are product claims. But the Office has ignored the fact that part of this process limitation is a product limitation: the Pd coating on the Cu wire. The Pd coating on the Cu wire yields a Pd coating (or cladding) on the resulting Cu stud bump, yet the Office has not shown how the combination of the prior art teaches a Pd coating on the stud bump.

7. BT Epoxy Substrate

Current claim 72 contains the limitation that the substrate comprises a BT epoxy material. It is unlikely that the Office can show the skilled artisan would have been motivated to use such a substrate in the proposed combination in light of column 2, lines 18-21 of Shibata which teaches away from using epoxy resin material as the substrate.

8. Under Bump Metal

The Office recognizes that AAPA fails to describe the absence of an under bump metal (UBM) under the stud bump. The Office argues that eliminating the UBM in the Figure 1 device of AAPA would have been obvious because it has been held that omission of an element and its function is obvious if the function of the element is not desired. The Office argues that the

AAPA device would work without the UBM and it would be obvious to remove it and its desired function in order to reduce the cost.

The Office supports the rejection by citing M.P.E.P. § 2144.04(II). This section contains the statement that “omission of an element and its function is obvious if the function of the element is not desired.” But a closer analysis of the legal doctrine underlying M.P.E.P. § 2144.04(II) demonstrates that it does not support the Office’s position.

The Office’s position is that the Figure 1 device of AAPA can operate without the UBM because it is not required. But that is not what this legal doctrine states, nor is that what this section of the MPEP states. The focus is not on what is (or is not) “required.” Rather, the focus is on what is (or is not) “desired.” And the Office has stated on the record in the parent application, that the UBM would have been desired by the skilled artisan. Specifically, the Office admitted that the UBM makes the electrical pad “operate better.” *See Office Action of November 22, 2006, page 2.* In other words, if the UBM makes the electrical pad operate better, it stands to reason that such a component would be desirable to be included. Indeed, the inclusion of a component that makes a device operate better would seem to be accepted wisdom in any technology, and proceeding contrary to accepted wisdom in the art is evidence of non-obviousness. *See M.P.E.P. § 2145 X(D)(III); see also, In re Hedges, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986).*

Thus, the Office has not substantiated a *prima facie* case of obviousness of the rejected claims over the proposed combination of references. Accordingly, Applicants respectfully request withdrawal of this ground of rejection.

CONCLUSION

For the above reasons, as well as those of record, Applicant respectfully requests withdrawal of the pending ground of rejection and allowance of the pending claims.

If there is any fee due in connection with the filing of this Amendment, including a fee for any extension of time not accounted for above, please charge the fee to our Deposit Account No. 50-0843.

Respectfully Submitted,

By 
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